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(54) Title: DEVICE FOR DETERMINING THE BASE STATION SUBSYSTEM INVOLVED IN A PAGING, AND METHOD FOR THE AUTOMATIC SET-UP OF THE DEVICE

(57) Abstract

The invention relates to a device for a GSM (Global System for Mobile Communication) communication system offering a GPRS (General Packet Radio Service), for determining the base station subsystems involved in a paging on a routing area level. Moreover, the invention relates to a method for setting up and/or updating the device. The set–up and/or the update of the device takes place in a GPRS service node, for example, after the receipt of a message on a set–up, a release or a modification of virtual connections. For this purpose the information contained in the message are evaluated and compared with already existing information. Another possibility is the evaluation of information in data packets, which, too, are compared with already existing information. Subsequently the information is, if required, updated and stored. In the case of a paging on a routing area level the stored information is used for communicating the signaling addresses of base station subsystems, which supply the routing area, to a GPRS service node. The information is also used for detecting as to which routing areas are supplied by a GPRS service node.

Device for determining the base station subsystems involved

in a paging, and method for the automatic

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set-up of the device

The invention relates to a device for a GSM (Global System for Mobile Communication) communication system offering a GPRS (General Packet Radio Service), for determining the base station subsystems involved in a paging on a routing area level. Moreover, the

10   invention relates to a method for setting up and/or updating the device.

In order to reach a mobile terminal, which is attached to a GPRS and which is ready to operate, the so-called stand-by mode, a paging is performed. A paging can be performed for packet-switched and circuit-switched connection requests. A paging for a packet-

15   switched connection request is performed by a GPRS service node (Supporting GPRS Service Node) on a routing area level. With regard to a circuit-switched connection request, a paging is performed in response to the network operation mode. If a GSM communication system offering a GPRS is operated in the network operation mode I, said paging - for a circuit-switched connection - is requested by a mobile services switching

20   center and is executed by a GPRS service node. The paging is executed on a routing area level and can cover one or several routing areas. For the purpose of the execution, the GPRS service node informs each base station subsystem involved in a paging by sending a message to the network service entity thereof. The base station subsystem or the base station subsystems thereupon transmit a paging request in the corresponding routing areas.

25   If the searched for terminal is reached, it responds to the a base station subsystem with a paging response. The base station subsystem informs the GPRS service node by means of a paging response.
(Stage 2, ETSI Standard GSM 03.60 Version 6.2.0, Release 1997; July 1998)

30   It is prior art that the information as to which base station subsystems are involved in a paging can be obtained from an allocation of routing areas identities to network service entity identifiers.

(ETSI Standard 8.16 TS 101 299 V6.1.0, Annex C, Release 1998; July 1998)

It cannot be inferred from the prior art as to how means which determine and evaluate such an allocation can be set up. One possibility to set up such an allocation is the manual

5   input, which is costly and subject to errors. It can neither be inferred from the prior art as to whether and how such means can be used beyond the determination of the base station subsystems involved in a paging.

In accordance therewith it is object of the invention to develop a device and a method for

10   the automatic set-up and/or update of such means. It is, moreover, an object of the invention to develop a method using said means beyond the determination of the base station subsystems involved in a paging.

According to the invention said object is provided by the teaching of patent claim 1, the

15   teaching of patent claim 5 and the teaching of patent claim 14.

It has thereby shown to be advantageous that the method allows for the automated set-up of a device, which informs a GPRS service node about network service entity identifiers of base station subsystems involved in a paging on a routing area level. In contrast to a

20   device which has to be set up and updated manually, working time is thereby saved and errors are avoided.

Furthermore, it proves to be an advantage that the means for allocating a routing area identity to network service entity identifiers are updated immediately after each

25   modification of virtual connections, whereby a valid allocation is available in the device at any time.

It is equally an advantage that said device is set up with only small signaling efforts and that only small transmission capacities are bound thereby remaining available for

30   telecommunication purposes.

It is, moreover, advantageous that the device for obtaining a routing area identity can be realized in a simple manner with means for converting data.

It is equally advantageous that the device for obtaining a cell global identifier can be
5   realized in a simple manner with means for converting data.

Further advantageous embodiments can be inferred from claims 2 to 13 and 15 to 25.

According to claim 7 and claim 18 it is an advantage that the identification of a base
10   station subsystem is implemented by means of a network service entity identifier, as a GPRS service node uses said network service entity identifier for addressing the base station subsystems thereby avoiding additional conversions.

It is also advantageous according to claim 8 and claim 19 to implement the identification
15   of a routing area by means of a routing area identity, as said routing area identity can be determined with little effort.

According to claims 9 to 11 and 20 to 22 it is also an advantage to make a difference between individual virtual connections thereby facilitating a possible check of stored data.
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Another advantage according to claim 3 and claim 23 is also the feasibility of multiple entries. Said multiple entries allow for a set-up and/or update of the allocating means in very few steps.

25   Additional advantages result according to claim 4 and claim 24 in the additional storage of a counter value, which reduces the number of elements in the allocating means.

According to claim 13 and claim 26 the use of the information stored in the allocating means is particularly advantageous for determining as to which routing areas are supplied
30   by a GPRS service node thereby avoiding the set-up, storage and administration of redundant information, which otherwise only use up working time, memory space and computer power.

In the following the invention is explained in more detail by means of embodiments and figures, wherein

5   Fig. 1.   shows signaling routes between GPRS service nodes and base station subsystems (prior art),

Fig. 2   shows a schematic illustration of the procedure upon the information on the set-up, release and modification of a virtual connection,

Fig. 3a   shows an example of an allocation table additionally comprising a cell global

10   identifier,

Fig. 3b   shows an example of an allocation table allowing for multiple entries,

Fig. 3c   shows an example of an allocation table additionally comprising a counter value,

Fig. 4   shows the conversion of a cell identifier to a routing area identity RAI,

15   Fig. 5   shows the conversion of a cell identifier to a cell global identifier CGI, and

Fig. 6   shows the schematic illustration of the procedure upon the extraction of information on the set-up, release and modification of a virtual connection from data packets,

Fig. 7   shows the schematic illustration of the procedure upon the information on

20   the set-up, release and modification of a virtual connection, wherein a table comprising information on existing virtual connections and an allocating means are realized independently from each other.

In the following, a signaling route of a GSM communication system offering a GPRS

25   according to the prior art is explained. For this purpose figure 1 illustrates a section from such a signaling route according to Standard GSM 08.16 Version 6.1.0.

On the level of the network service protocol, a GPRS service node SGSN is represented by several network service entities NSE1 and NSE3. Said network service entities are each

30   connected with a network service entity NSE2 or NSE4, respectively, via a network service virtual connection NSVC1 or NSVC2, respectively, in base station subsystems BSS1 or BSS2. In general, a base station subsystem and a GPRS service node can be

connected with each other via more than one virtual connection. The network service entities of the network service connection are characterized by their network service entity identifiers NSEI1 and NSEI2. The network service entities connected with each other thereby have the same network service entity identifier in the GPRS service node SGSN

5   and the base station subsystem BSS1 or BSS2. On the base station subsystem GPRS protocol layer, the so-called BSSGP layer, on top thereof, the network service virtual connections NSVC1 or NSVC2 are split into several virtual connections (base station system GPRS protocol virtual connections) BVC, via which, for instance, signals are transmitted.

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Set-up and modification of a virtual connection are commonly initiated by a base station subsystem and communicated to a GPRS service node SGSN. No explicit message is provided in the standards for setting up one or more virtual connections. The detection of a release of one or more virtual connections commonly takes place implicitly, for instance,

15   by using a new virtual connection identifier for a known cell. From this is concluded that the initial virtual connection has been disconnected. Another possibility is that a known virtual connection identifier is used for another cell, from which is concluded that the virtual connection has been modified. A release can also be detected by that a virtual connection used for signaling, usually the virtual connection number zero, is set up anew.

20   This commonly deletes all virtual connections between a base station subsystem and a GPRS service node.

A base station subsystem informs the GPRS service node SGSN at least on the set-up and modification of virtual connections, for instance, by transmitting a so-called NM BVC

25   RESET (Network Management BSSGP Virtual Connection Reset) message or by transmitting a so-called NM BVC RESET ACK message, in case a GPRS service node SGSN has initiated a connection set-up.

An NM BVC RESET message either shows that a modification or set-up of one or more

30   virtual connections has already taken place, or requests the implementation thereof. A network service entity identifier NSEI of a forwarding base station subsystem BSS is

known to a GPRS service node SGSN by means of the network service entity identifier of
the network service entity which received the packet.

So much for the prior art, which was described herein for facilitating the person skilled in
5   the art the association and comprehension of the invention, which is further explained in
the following.

Figure 2 shows one possible way how a GPRS service node SGSN detects and
differentiates between a set-up, a release or a modification of a virtual connections by
10   means of the information received in an NM BVC RESET message NBRM. Upon the
receipt of an NM BVC RESET message NBRM in a GPRS service node SGSN - in figure
2, for instance, transmitted by a base station subsystem BSS - the information contained in
the NM BVC RESET message NBRM are converted by data conversion means IET and
IET2. The data conversion is optional and is here only introduced for illustrating the
15   example. It is explained in more detail in the descriptions of figures 4 and 5. Basically, the
process can also be implemented with information elements contained in an NM BVC
RESET message NBRM. The GPRS service node SGSN evaluates the information
contained in the message in the checking and evaluating means MFC. The checking and
evaluating means MFC and a means for the automatic set-up and for the automatic update
20   MFBA have here exemplarily been realized to form a unit. For the purpose of checking,
the checking and evaluating means MFC compares the information from the NM BVC
RESET message NBRM with already existing information. For this purpose the checking
and evaluating means MFC transmits a request REQ to a table TAB, which information on
the one or more virtual connections in question are already available. Tables containing
25   part of said information are prior art and are proposed, for example, in the ETSI Standard
GSM 08.16 V6.1.0 Release 1998, Annex A in Table A.4. For carrying through the
comparison required in the invention, a routing area identity is necessary. In accordance
with the invention, the table known from the Standard was extended by the routing area
identity RAI. The extension allows the automatic detection as to when a cell was allocated
30   to another routing area. The table TAB delivers the information on already existing virtual
connections concerned in a message ANS. If the information in the NM BVC RESET
message NBRM for a known virtual connection differ from the known information, a

modification or release of a virtual connection has taken place. If a virtual connection is not yet known, it is concluded that a set-up of said virtual connection takes place. In the case of a set-up, a modification or a release of one or more virtual connections the checking and evaluating means MFC delivers the relevant information to the means for the

5   automatic set-up and for the automatic update MFBA. In respect of the example as shown in figure 2, the information refer to whether and which entries for virtual connections are to be deleted or entered anew as well as, if required, to data required for a new entry. As to which data are stored by the means for the automatic set-up and for the automatic update MFBA in the allocating means MFA depends on the information stored in the allocating

10   means MFA, which is explained in more detail in the descriptions of figures 3a, 3b and 3c.

The procedure illustrated in figure 7 entirely corresponds to the one already explained in figure 2. The differences between the situation in figure 7 and figure 2 consist in the different realization of the allocating means MFA. Instead of realizing the allocating

15   means MFA together with a table TAB, which stores information on existing virtual connections, they are separated from each other in the conversion according to figure 7. Correspondingly also the checking and evaluating means MFC is separated from the means for set-up and update MFBA. Thereby the information flow between the allocating means MFA and the set-up and update means MFBA becomes more graphic. Thus, the

20   message mentioned in the description of figure 3 is converted to one or more messages MSG.

The message NM BVC RESET is known from the GSM Standard 08.18 Version 6.2.0 Release 1997, published in October 1998. As to how the routing area identity and a cell

25   global identifier can be obtained from the information contained in an NM BVC RESET message is explained in the following.

An information element - the so-called cell identifier - contained in the message is converted to a routing area identity RAI in the GRPS service node SGSN by means IET

30   comprising means for converting data.

Figure 4 shows as to how the means IET obtains a routing area identity RAI from a cell identifier.

The cell identifier contains the following message elements: A message element for identifying the information element cell identifier, for instance, an identifier for information elements INFORMATION ELEMENT IDENTIFIER, a message element showing the length of the information element, for instance, a length indicator LENGTH INDICATOR, one or more message elements which clearly identify a location area, a routing area and a cell worldwide. Said identification can take place in several parts, for example, by using an identifier of a country where the network is located, for example, a mobile country code MCC, and an identifier of the network within said country, for example, a mobile network code MNC. After the network has unmistakably been identified worldwide, the location area, the routing area and the cell have to be clearly determined only within said network. This can be achieved in view of the location area by means of a location area code LAC. Within a network a routing area can be identified by means of a routing area code RAC and a cell by means of a cell identity CI.

The means for converting data of means IET generates said information, which clearly identifies a routing area worldwide, for instance, a routing area identity RAI, from message elements being contained in the cell identifier. A routing area identity RAI can be made up of the message elements mobile country code MCC, mobile network code, location area code LAC and routing area code RAC.

Figure 5 shows as to how a cell global identifier CGI is obtained by means IET2 from a cell identifier. The means for converting data of means IET2 generates from message elements contained in a cell identifier the information, which clearly identifies a cell worldwide, for instance, a cell global identifier CGI. A cell global identifier CGI can be made up of the message elements mobile country code MCC, mobile network code MNC, location area code LAC and cell identifier value CI VALUE.

In a first embodiment said routing area identity RAI is stored in an allocating means MFA together with the network service entity identifier NSEI, a cell global identifier CGI and a virtual connection identifier.

Figure 3a shows as to how said information is stored, for instance, by a means for allocating routing area identities RAI to network service entity identifiers NSEI together with the cell global identifier CGI.

In this example, the allocating means MFA refers to a table. Further feasible realizations
5 can, for example, be sorting trees or lists, in which the described information is stored. Both the sequence of individual entries and the sequence of data fields within one entry are exemplary and do not restrict the invention to the indicated sequence. If the checking and evaluating means MFC detects a set-up of a virtual connection, it informs the means for set-up and update MFBA that a further entry is to be introduced in the allocating means
10 MFA. If the checking and evaluating means MFC detects a release of one or several virtual connections, it requests the means for the automatic set-up and for the automatic update MFBA to delete the corresponding entry or the corresponding entries from the allocating means MFA. If the checking and evaluating means MFC detects a modification of a virtual connection, it requests the means for the automatic set-up and for the automatic
15 update MFBA to delete the old entry and to store a new entry with the updated data.

When a GPRS service node starts paging, it sends a routing area identity RAI to the allocating means MFA. Said means delivers all network service entity identifiers NSEI, which can be located with the indicated routing area identity RAI. In the case as
20 illustrated in figure 3, this would be in the case of routing area identity RAI 1 the network service entity identifiers NSEI a and b with the cell global identifier CGI 1 to 5.

In a second embodiment a network service entity identifier NSEI and a routing area identity RAI are stored in the allocating means for each virtual connection. In an example,
25 figure 3b shows the contents of a table, which illustrates one of the possible allocating means. Analogously to the illustration in figure 2, said table constituting the allocating means MFA can be realized together with a table TAB, which stores information on existing virtual connections. Analogously to the illustration in figure 7, it can, however, also be realized separately from the table. With each set-up of a virtual connection a
30 combination of network service entity identifier NSEI and routing area identity RAI is stored. With each release of a virtual connection such a combination is deleted. A modification of a virtual connection constitutes a combination of set-up and release of a

virtual connection, which means that an existing entry is deleted and replaced by a new entry. Due to the possibility to effect multiple entries for identical combinations, the table always contains as many entries as virtual connections exist. The procedure for a paging corresponds to the one described in the first embodiment. Upon a request of a GPRS

5   service node, the allocating means is searched through by means of a routing area identity RAI. In this example, the search with a routing area identity RAI 1 provides for the network service entity identifiers NSEI a and b.

In a third embodiment also a counter value CNT is stored in the allocating means besides

10   the routing area identity and the network service entity identifier. Figure 3c illustrates a table showing one of the possible conversions of the allocating means. Said counter value CNT represents the number of virtual connections having an identical routing area identity RAI and network service entity identifier NSEI. In the case where a counter value is stored, the allocating means MFA has to be implemented separate from a table TAB,

15   which stores information on existing virtual connections. If a new virtual connection is set up, said counter value is increased by one, or, if a combination of network service entity identifier NSEI and routing area identity RAI is concerned, for which there is not yet an entry, a new entry is generated. Analogously thereto the counter value CNT is reduced by one when a virtual connection is disconnected. In the case where a virtual connection for a

20   specific combination of routing area identity and network service entity identifier no longer exists, two solutions are feasible. The corresponding entry is either deleted, or the corresponding counter value CNT is set to zero. In said example the corresponding entry is deleted and, if required, set up anew. A modification of a virtual connection constitutes a combination of a set-up and a release of a virtual connection. This means that the counter

25   value for the previous combination of routing area RAI and network service entity identifier NSEI is reduced by one, or that the entry is removed, respectively, and that the counter value CNT is increased by one for the latest combination or a new entry is set up, respectively. The procedure for a paging corresponds to the one of the second embodiment. Upon a request by a GPRS service node the allocating means is searched

30   through by means of a routing area identity RAI. In said example the search in a routing area identity RAI 1 delivers the network service entity identifiers NSEI a and b. The

counter value CNT is of no significance for a GPRS service node and is, therefore, not transmitted.

In a fourth embodiment information, which can be obtained from the transmitted data

5   packets, are used for setting up and updating the allocating means.

For this purpose, the packets having been forwarded by a base station subsystem BSS to a GPRS service node SGSN are examined. Figure 6 shows a possible way as to how such an examination can be carried out, and how, according to the results, the allocating means can be set up and updated. A base station subsystem BSS forwards a data packet to a GPRS

10   service node SGSN. Each packet contains a cell identifier, from which a routing area identity RAI and a cell global identifier CGI can be obtained with the means described in figures 4 and 5 comprising means for converting data IET and IET2. As packets can only be transmitted from a base station subsystem BSS to a GPRS service node SGSN via existing connections, a virtual connection identifier BVCI contained in a packet identifies

15   such a connection.

A network service entity identifier NSEI of a relaying base station subsystem BSS is known to an examining GPRS service node SGSN through the network service entity identifier of the network service entity, which received the packet. The virtual connection

20   identifier BVCI, the cell global identifier CGI, the routing area identity RAI and the network service entity identifier NSEI, which were obtained from the information contained in the data packet, are compared by the checking and evaluating means MFC with already stored information. For this purpose the checking and evaluating means MFC transmits a request REQ to a table TAB, which already has information on the virtual

25   connection in question available. Tables containing parts of said information are, for instance, proposed as Table A.4 in ETSI Standard GSM 08.16 V6.1.0 Release 1998, published September 1998, Annex A. For the use of this table according to the invention, it still has to be extended by an information identifying a routing area. The extension allows for the automatic detection as to when a cell was allocated to another routing area.

30   In this example a routing area is identified by a routing area identity RAI. The table TAB delivers the requested information in a message ANS.

If the information deviate from the stored information, a modification of the virtual connection is concluded. If the information is new, a new set-up of a virtual connection has taken place. A release of a virtual connection is assumed, if a certain time has passed since the last examination of an entry.

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The checking and evaluating means MFC transmits a message MSG to the means for set-up and update MFBA. Said message MSG contains at least information as to whether a new entry for a virtual connection has to take place, or whether an existing entry is to be deleted. If an entry is to be deleted, the message MSG contains information which clearly identify an entry, for example, a cell global identifier CGI. If an entry is to be set up anew, the message MSG at least contains a network service entity identifier NSEI, a routing area identity RAI and a cell global identifier CGI. In the case of a modification of the virtual connection, the initial entry in the allocating means MFA is deleted by the means for set-up and update MFBA and a new entry for the updated virtual connection is set up. In this case the checking and evaluating means MFC transmits a message MSG for each new entry and for each deletion of an entry. An entry in the allocating means comprises in this embodiment a cell global identification CGI, a routing area identity RAI, a network service entity identifier NSEI and a timer value T. Said timer value T indicates the time at which the entry was examined for the last time. This time corresponds to the time, at which the last data packet was received via this virtual connection. If this time was before a certain threshold value, a release of the virtual connection is assumed. Said timer value T can be inserted by the allocating means independently. A possibility to control the time passed since a transmission consists in setting the timer value at a threshold value when effecting an entry or examining an entry. The timer values of all entries are then reduced by one at regular intervals. When an entry has reached the timer value value zero, it will be deleted.

If a virtual connection is set up, a new entry is set up in the allocating means MFA by the means for set-up and update MFBA. In the case that a release of a virtual connection has taken place, the entry in the allocating means MFA is deleted by the means for set-up and update MFBA. The allocating means can, for instance, be one or several tables, one or several sorting trees and one or several lists or combinations of said means.

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The invention is not restricted to the embodiments illustrated in the examples, but can, among others, also be achieved through combinations of embodiments shown in the examples.

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A combination of an embodiment setting up and updating allocating means by using the NM BVS RESET and NM BVC RESET ACK messages, and of an embodiment setting up and updating allocating means by using the information contained in the data packets can be particularly efficient.

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Patent Claims

1.   Method for setting up and updating means for determining base station subsystems
involved in a paging on a routing area level, for a GSM (Global System for Mobile
Communication) communication system offering a GPRS (General Packet Radio
Service), comprising the following steps:

- evaluating signals sent by a base station subsystem (BSS) and
determining an identifier of the base station subsystem (BSS),

- detecting set-up, release and modification of one or more virtual
connections (BVC) by means of evaluation and determination,

- comparing with already existing information about one or more virtual
connections (BVC), if the detection cannot be implemented by means
of evaluation and determination,

- identifying one or more virtual connections to be set up, released
and modified by means of information obtained during evaluation,
determination, detection and comparison,

- deleting, storing or updating information about the one or more virtual
connections (BVC), which contain one or more information identifying
a base station subsystem (BSS) being involved in the virtual connection
and a routing area (RA) containing a cell being involved in the virtual
connection.

2.   Method according to claim 1, comprising the steps:

- evaluating information from one or more data packets transmitted by a
base station subsystem (BSS), and an identifier of the base station
subsystem,

and

- comparing with already existing information about one or more virtual
connections (BVC).

3.   Method according to claim 1 or 2, wherein

multiple entries are implemented in an allocating means for identical combinations

of one or more information which identify a routing area and a base station

subsystem.

4.   Method according to claim 1 or 2, wherein

a counter value (CNT) is stored in an allocating means for each combination of one

or more information which identify a routing area and a base station subsystem.

5.   Method according to claim 1, wherein

instead of information contained in signals, information contained in data packets

are evaluated and compared with already existing information on virtual

connections (BVC).

6.   Method according to claim 5, comprising the steps:

-    evaluating information from signals transmitted by a base station subsystem

(BSS), and

comparing with already existing information on one or more virtual

connections (BVC), if the evaluation is not sufficient for the detection.

7.   Method according to one of claims 1 to 6, wherein

a base station subsystem is clearly identified by means of a network service entity

identifier.

8.   Method according to one of claims 1 to 7, wherein

a routing area is clearly identified by means of a routing area identity.

9.   Method according to one of claims 1 to 8, wherein

an information is stored, which identifies a virtual connection.

10. Method according to claim 1 to 9, wherein virtual connections are distinguished by means of an information which clearly identifies a cell.

11. Method according to one of claims 1 to 10, wherein a cell is identified by means of a cell global identifier.

12. Method according to one of claims 1 to 11, wherein a timer value (T) is stored for each combination of one or more information which identify a routing area and a base station subsystem.

13. Method according to one of claims 1 to 12, wherein it is determined by means of the information stored in the allocating means as to which routing areas are covered by a service area of a GPRS service node.

14. Device for a GSM (Global System for Mobile Communication) communication system offering a GPRS (General Packet Radio Service),

characterized by,

means for the automatic set-up and/or for the automatic update of allocating means sending one or more information, which identify one or more base station subsystems involved in a paging, to a GPRS service node executing a paging on a routing area level.

15. Device according to claim 14, comprising a checking and evaluating means, which evaluates information from one or more signals containing information on virtual connections, and an identifier of the base station subsystem, which transmitted the one or more signals, and which compares said information with information on existing virtual connections if the information for the detection and differentiation of set-up, modification and release of one or

more virtual connections is not sufficient, and which identifies virtual connections to be set up, released and modified and communicates to the means for the automatic set-up and/or the automatic update as to which steps have to be implemented in the allocating means.

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16. Device according to claim 15, wherein the checking and evaluating means evaluates information contained in data packets.

17. Device according to one of claims 14 to 16, wherein

10 the allocating means allocates a base station subsystem by means of a network service entity identifier.

18. Device according to one of claims 14 to 17, wherein the allocating means allocates a routing area by means of a routing area identity.

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19. Device according to claims 14 to 18, wherein the allocating means stores one or more information which determines a base station subsystem and a routing area, and one or more information which differentiates between individual virtual connections.

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20. Device according to claim 19, which differentiates between virtual connections by means of an information which clearly identifies a cell.

25 21. Device according to claim 20, which identifies a cell by means of a cell global identifier.

22. Device according to one of claims 14 to 18, wherein allocating means stores multiple entries of identical combinations of one or more

30 information determining a base station subsystem and a routing area.

23. Device according to claims 14 to 18, wherein

the allocating means stores a counter value (CNT).

24.   Device according to claims 14 to 23, wherein

the allocating means stores a timer value (T).

5   25.   Device according to claims 14 to 24,

comprising determining means, which determine by means of the information

stored by the allocating means as to which routing areas are covered by a service

area of a GPRS service node.

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FIG. 1
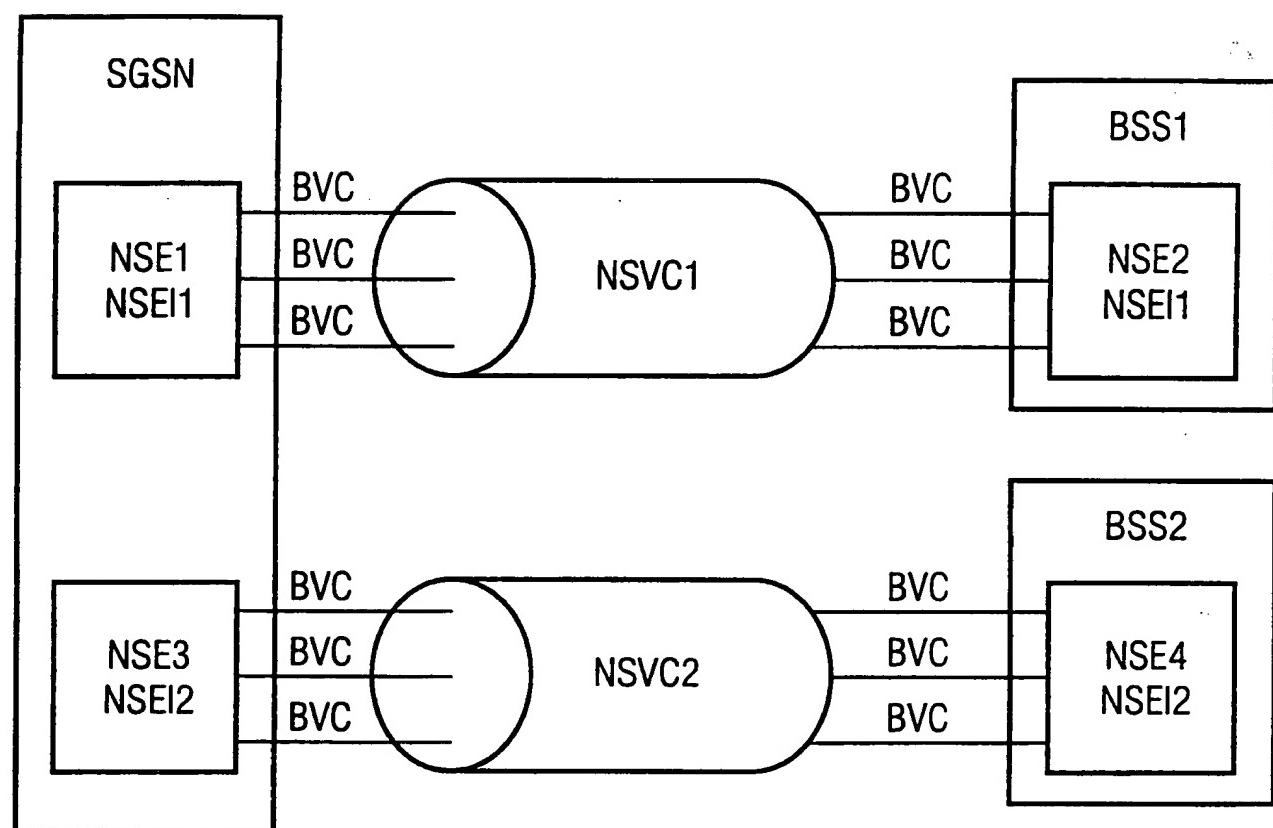
FIG. 2
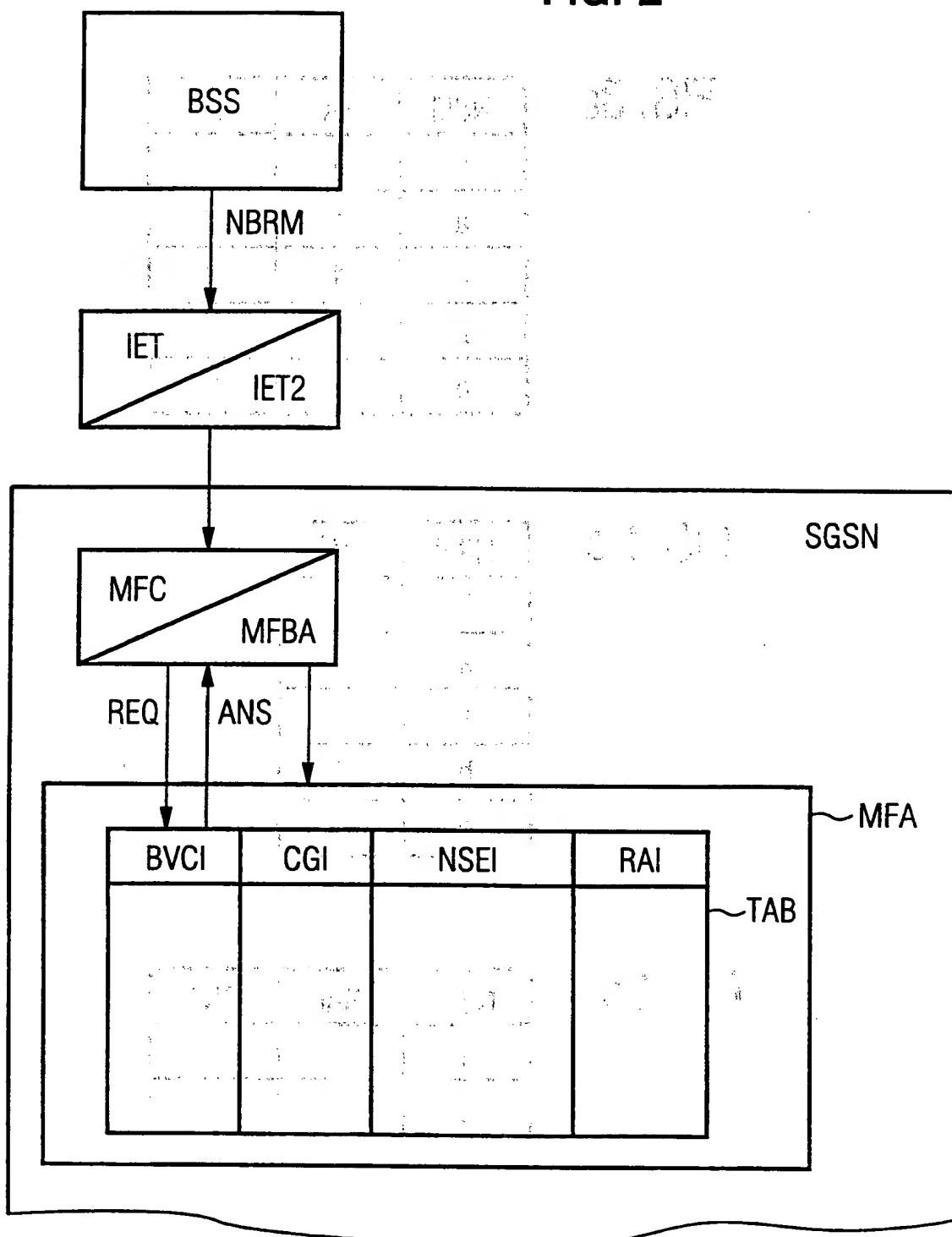
FIG. 3a

NSEI	RAI	CGI
a	1	1
a	1	2
a	1	3
b	1	4
b	1	5

FIG. 3b

NSEI	RAI
a	1
a	1
a	1
b	1
b	1

FIG. 3c

NSEI	RAI	CNT
a	1	3
b	1	2

FIG. 4

CELL IDENTIFIER
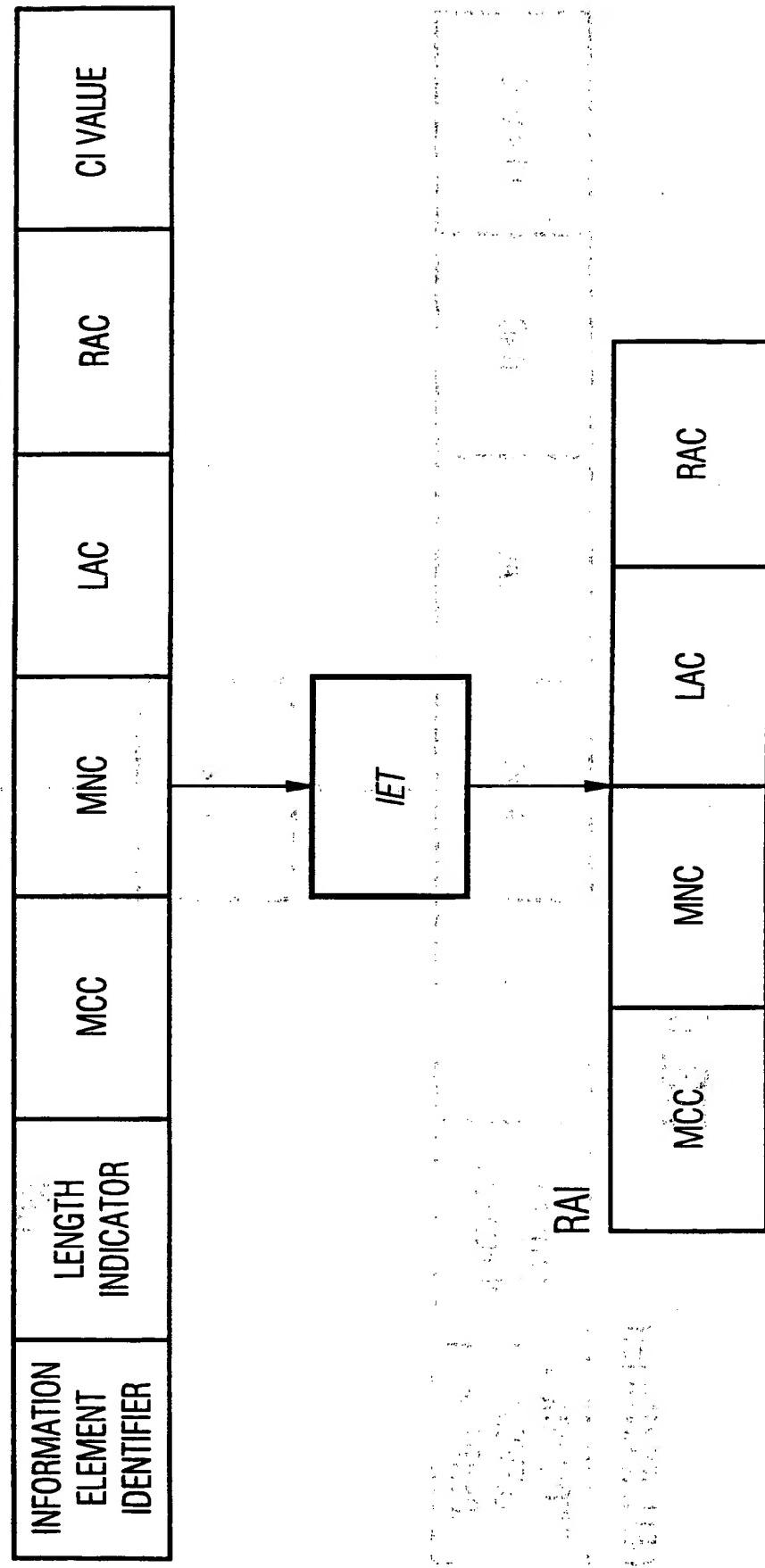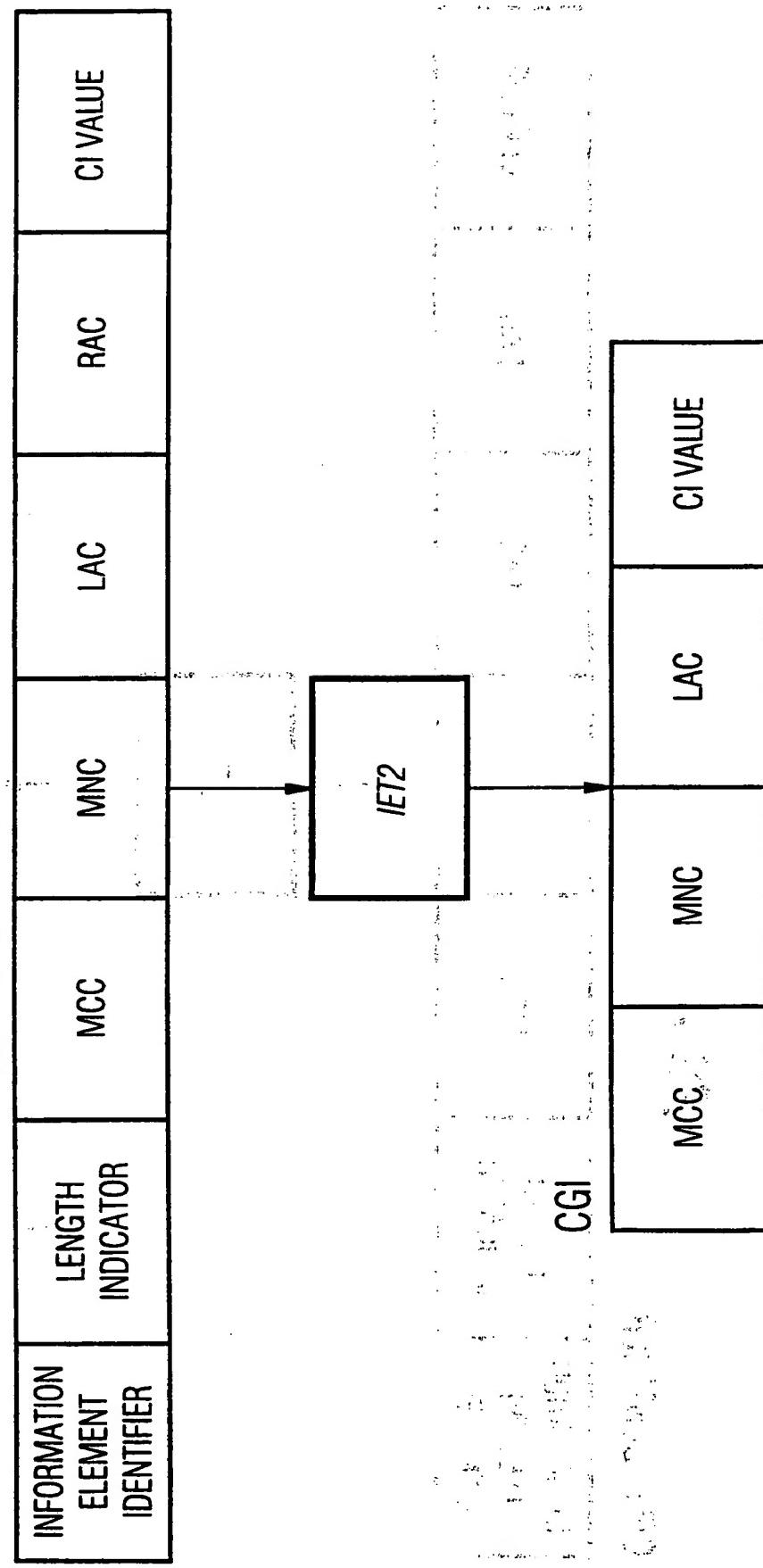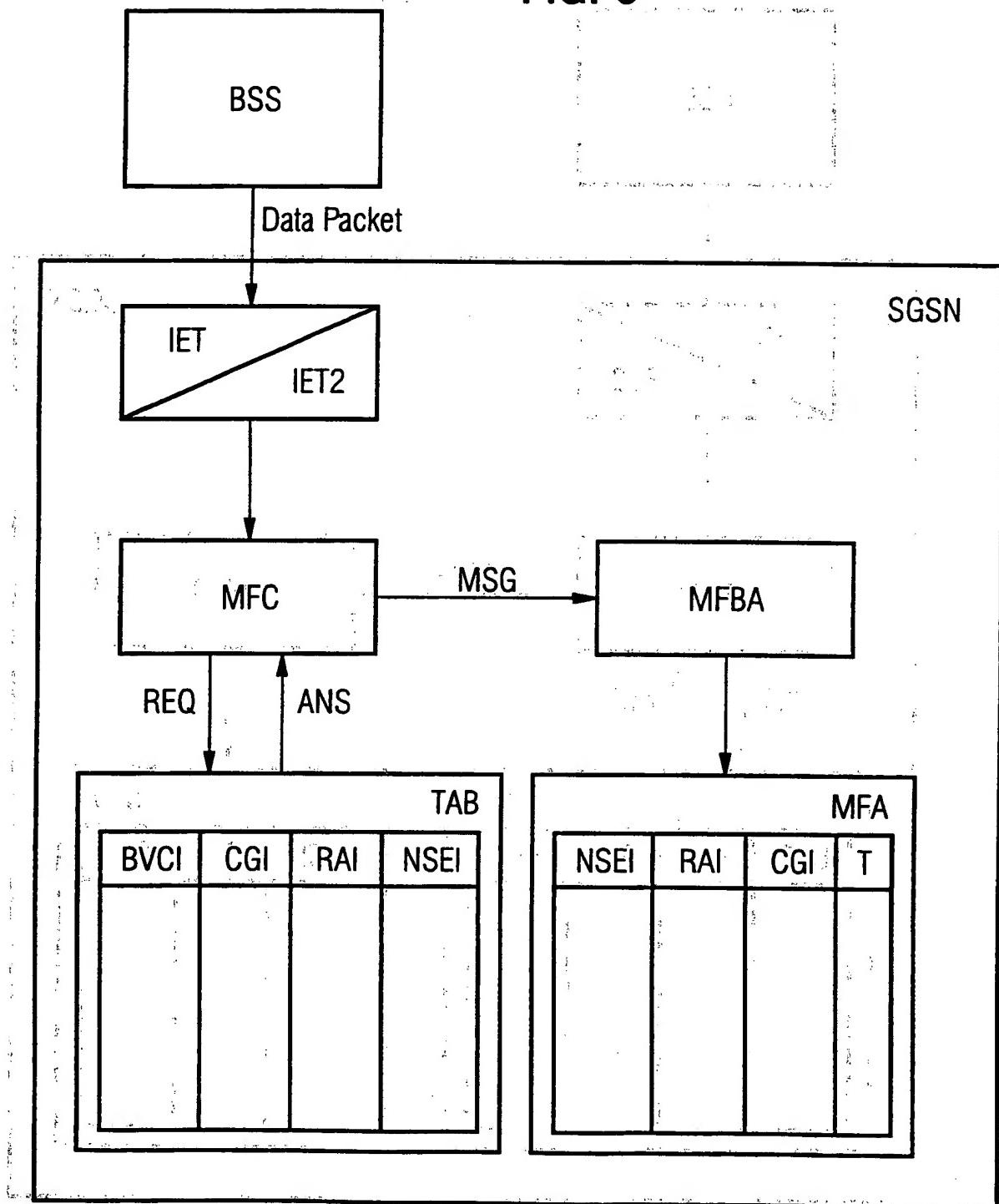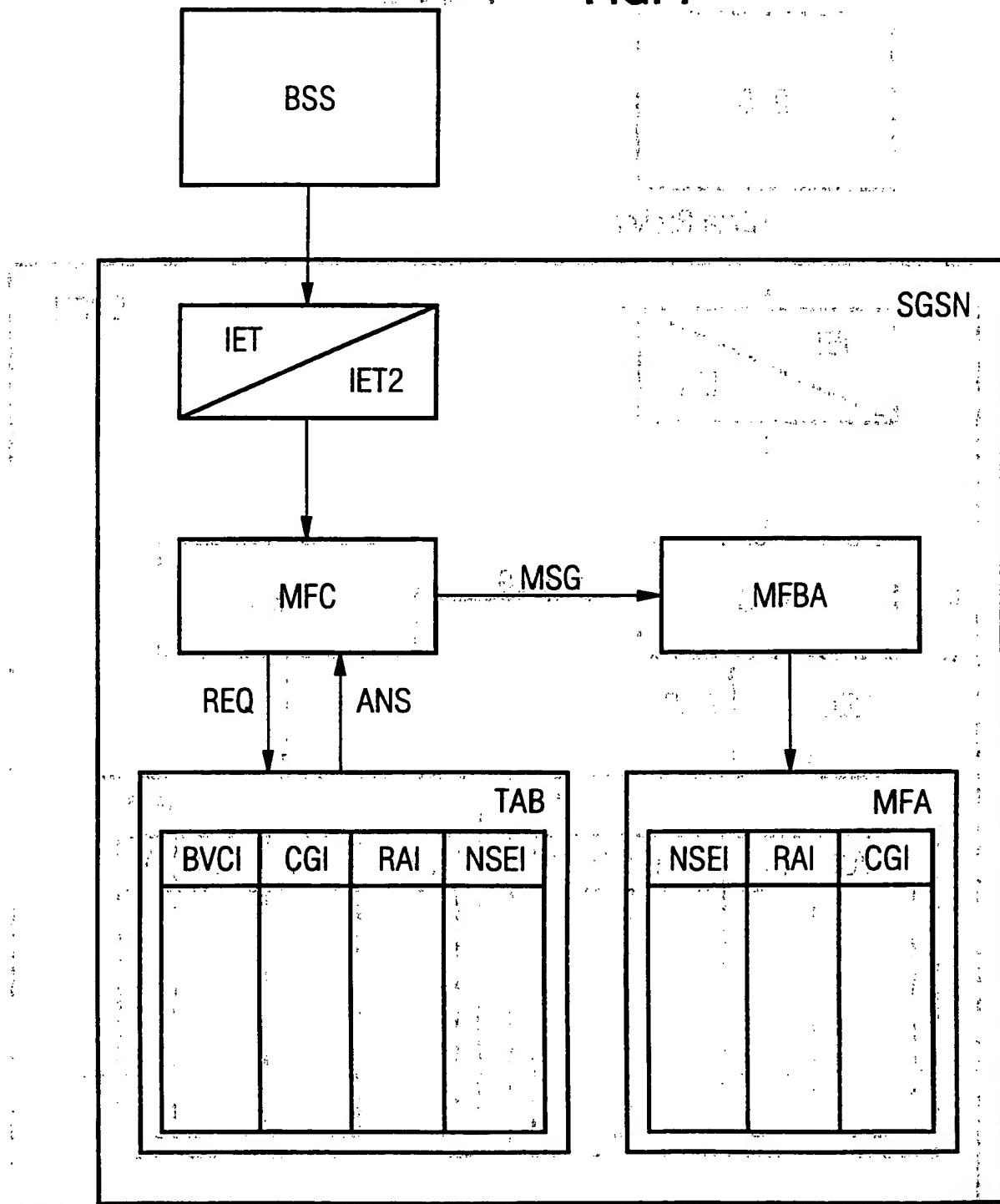
INFORMATION ELEMENT IDENTIFIER	LENGTH INDICATOR	MCC	MNC	LAC	RAC	CI VALUE

IET

RAI

MCC	MNC	LAC	RAC

FIG. 5

CELL IDENTIFIER

INFORMATION ELEMENT IDENTIFIER	LENGTH INDICATOR	MCC	MNC	LAC	RAC	CI VALUE

IET2

CGI

MCC	MNC	LAC	CI VALUE

FIG. 6

FIG. 7

INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H04Q7/22

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 196 11 947 C (SIEMENS AG) 5 June 1997 (1997-06-05)	14
A	column 4, line 25 -column 7, line 57	1
A	"Digital cellular telecommunications system (Phase 2+); General Radio Packet Service (GPRS); Base Station System (BSS)- Serving GPRS Support Node (SGSN); BSS GPRS Protocol (BSSGP) (GSM 08.18 version 6.2.0 Release 1997)" , EUROPEAN TELECOMMUNICATIONS STANDARD INSTITUTE (ETSI) , SOPHIA ANTIPOLIS (FR) XP002122606 cited in the application page 20, paragraph 5.4.1 page 31, paragraph 8.3 -page 33, paragraph 8.5	1,14

-/--

X	Further documents are listed in the continuation of box C.		X	Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
29 August 2000	04/09/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	Gerling, J.C.J.

Form PCT/ISA/210 (second sheet) (July 1992)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category°	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
A	"Digital cellular telecommunications system (Phase 2+); General Radio Packet Service (GPRS); Base Station System (BSS)-Serving GPRS Support Node (SGSN) interface; Network Service (GSM 08.16 version 6.1.0 Release 1997)" , EUROPEAN TELECOMMUNICATIONS STANDARD INSTITUTE (ETSI) , SOPHIA ANTIPOLIS (FR) XP002122607 cited in the application page 35 -page 48	1,14

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 19611947 C	05-06-1997	US 6081723 A	27-06-2000